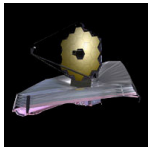

8915 - In Search of Siblings: Spectroscopic Follow-Up of a Candidate Massive Quiescent Galaxy at z ~ 7

Cycle: 4, Proposal Category: GO

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1	pano-z7qg-cand_v15	NIRSpec MultiObject Spectroscopy	(5) pano_z7qg-cand_apt_catalog_v5

ABSTRACT

The emergence of the first quiescent galaxies in the Universe is a key question of modern astrophysics, which can now finally be tackled thanks to JWST's unprecedented near-IR spectroscopy. The recent confirmation of the massive quiescent galaxy (MQG) RUBIES-UDS-QG-z7 at z=7.29 has been an enormous surprise, pushing the record for the most distant known such galaxy ~500 Myr closer to the Big Bang. The mere existence of RUBIES-UDS-QG-z7 suggests a number density of MQGs as early as z~7 that is ~100x higher than found in *any* modern galaxy simulation. However, inferring a number density from a single source is notoriously difficult and uncertain due to Poisson noise and cosmic variance. It is therefore essential to thoroughly search for more objects like these. Here we exploit the full archive of extragalactic legacy imaging data available to date with at least 6 NIRCam wide filters spanning over 0.28 sqdeg on the sky. Only one single, reliable quiescent galaxy candidate like RUBIES-UDS-QG-z7 is found. The source has a well-measured photometric redshift z=7.30+/-0.14 and shows evidence of a strong Balmer break and an extended star-formation history with a rapid decline in the SFR in the last ~70 Myr prior to the time of observation. However, we cannot rule out that the red colors are not driven by extreme line emission of an extremely young star-burst at z=5.5. We therefore propose to observe this source with a 2hr deep NIRSpec/PRISM spectrum to confirm (or refute) its post-starburst nature at z~7. This program has the promise to identify a second MQG just 700 million years after the Big Bang which would further challenge current models of galaxy formation.

OBSERVING DESCRIPTION

The main goal of this proposal is to spectroscopically follow up a candidate massive quiescent galaxy at z~7, to confirm or refute its post-starburst nature. To unambiguously test this, we need to be able to detect individual Balmer absorption features at a SNR of ~5.

To achieve this, we choose the PRISM/CLEAR grating/filter pair with a 3 shutters slitlet shape, 2 times 3 nods for optimal background subtraction, a single integration per exposure and 17 groups per integration. Using the NRSIRS2 readout, this corresponds to a total exposure time of 7527.87s.

We will make sure that the primary target is well-centered in the MSA shutter to avoid unnecessary slit losses, and open shutters on potential neighbors within delta_z ~ 0.5, and any galaxies at z>3, prioritizing bright and red targets.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(5)	pano_z7qg-cand_apt_catalog_v5	RA: 09 42 31.4647 (145.6311029d) Dec: +09 23 14.53 (9.38737d) Equinox: J2000		

Comments:
Description=[]

Observation

Proposal 8915, Observation 1: pano-z7qg-cand_v15 Fri Feb 27 00:00:17 GMT 2026

Diagnostic Status: Warning

Observing Template: NIRSpec MultiObject Spectroscopy

Diagnostics

(pano-z7qg-cand_v15 (Obs 1)) Warning (Form): Config c1 (#1) has 1 master background shutters affected by failed open or closed shutters.

(pano-z7qg-cand_v15 (Obs 1)) Warning (Form): Config c1 (#2) has 1 master background shutters affected by failed open or closed shutters.

(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Visit 1:1) Warning (Form): The recommended value is 8 Reference Stars for this template.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(5)	pano_z7qg-cand_apt_catalog_v5	RA: 09 42 31.4647 (145.6311029d) Dec: +09 23 14.53 (9.38737d) Equinox: J2000		

Comments:
Description=[]

Acquisition

#	Reference Star Bin	Target	Filter	MSA Configuration	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	Optional ETC ID
1	Filter: F140X; Readout: NRSRAPIDD6; 7 sources in 3 quads; [Optimal TA Accuracy]	SAME	F140X	Auto Acq MSA Config	NRSRAPIDD6	3	1	4	687.153	

Template

TA Method	HFF Readout Mode	Obtain Confirmation Images	Science Aperture	Primary Candidate List	Filler Candidate List	Spectral Overlap Map	Spectral Overlap Threshold
MSATA	false	After Target ACQ	MSA Center	primary (1 sources)	fillers (1815 sources)	jwst-nirspec-prism	1.5

Reference Stars

Visit	ID	RA	Dec	Magnitude	Visit	ID	RA	Dec	Magnitude
1	1958	145.632124	9.396819	23.164594650268555	1	4208	145.619058	9.359043	23.24024772644043
1	2572	145.635709	9.388795	23.690654754638672	1	4350	145.627278	9.357288	23.517024993896484
1	2666	145.640858	9.389240	23.280479431152344	1	5016	145.628509	9.349016	23.61167335510254
1	3287	145.617852	9.370829	23.605186462402344					

Confirmation

#	Confirmation Type	Conf. Readout Pattern	Conf. Groups/Int	Conf. Integrations/Exp	Conf. Total Integrations	Conf. Total Exposure Time
1	After Target Acq	NRSIRS2RAPID	5	1	1	87.533

Spectral Elements

#	Exposure Specification	MSA Configuration	Nod Pattern	Pointing	Aperture PA	Dispersion Offset (Shutters)	Cross-Dispersion Offset (Shutters)	Total Dithers	Total Integrations	Total Exposure Time
1	1 (PRISM/CLEAR)	c1	3 Shutter Slitlet	145.62999166666665 Degrees 9.370011111111111 Degrees	245.47435433113523			3	3	3763.934
2	1 (PRISM/CLEAR)	c1	3 Shutter Slitlet	145.62999166666665 Degrees 9.370011111111111 Degrees	245.47435433113523			3	3	3763.934

Special Requirements

Background Limited. Background no more than 50th percentile above minimum
MSA Scheduled Aperture PA 245.4745 to 245.4745 Degrees (V3 106.89993 to 106.89993)